5.6 GEOLOGY AND SOILS

This section provides an evaluation of the project's impact in relation to existing geologic and soils conditions within the project site. Information contained in this section is summarized from the following documents:

- *Environmental Impact Report (EIR)-Level Soil and Geologic Reconnaissance*, GEOCON, October 20, 2011 (Appendix J-1);
- *Preliminary Geotechnical Investigation*, GEOCON, May 11, 2012 (Appendix J-2 of this EIR); and
- *Former South Quarry Amended Reclamation Plan Draft and Final EIR* (referred to herein as Reclamation Plan EIR), HELIX Environmental Planning Inc, September 2008 and February 2010, respectively.

The technical appendices are included on the attached CD found on the back cover of this Environmental Impact Report (EIR). Additional background information was also gathered from the City of Carlsbad General Plan.

5.6.1 Existing Conditions

Site Geology

The Reclamation parcel in the eastern portion of the project site has undergone many years of rock mining, associated rock crushing, and material screening to produce commercial aggregate products. The majority of this previous mining activity occurred in the eastern and southern portions of the project site. Waste products from mining were subsequently placed in canyon or pit areas to reclaim quarry excavations. This has resulted in placement of mostly undocumented fill in depressions, as well as some compacted fill. A former concrete batch plant and base-coarse crushing and screening plant operated by Hanson Aggregates recently occupied the central portion of the Reclamation parcel. Other portions of the Reclamation parcel were previously used for storage purposes, including stockpiling of concrete and asphalt rubble, bioremediation, and other materials.

Reclamation grading of the previously mined area began in July 2011 upon adoption of the amended Reclamation Plan. Reclamation grading has since been largely completed. During reclamation grading, undocumented fills and alluvial soils within the drainage area have been removed to within three feet of the groundwater elevation and recompacted. Drop structures, levees, and rock revetment slopes have also been constructed along, and within the Buena Vista Creek drainage. Reclamation grading has involved removal of undocumented fill and replacement with compacted fill on the north side of Buena Vista Creek and majority of the areas south of the creek. Reclamation grading has prepared large sheet graded pads on the eastern half of the project site, on both the north and south sides of Buena Vista Creek.

Topography

Topographically, the project site slopes northward, southward, and westward following the east-west natural drainage of Buena Vista Creek valley and its tributaries. The original valley-slope topography has been lowered by quarry operations to create moderately sloping surfaces in most of the planned Reclamation area. However, mining of rock in the northeastern portion of the project site has created near-vertical rock slopes. The cut has exposed fractured rock which is very strong and considered stable in its temporary steep condition. Slopes on the south side of the valley have been graded to permanent 2:1 (horizontal:vertical) cut slopes with benches, bench-drains and brow-ditches. On the north side of the

project site, reclamation grading has resulted in 2:1 cut slopes. Elevations in the eastern half of the project site vary from approximately 80 feet above mean sea level (AMSL) to 300 feet AMSL in open-space areas. On the western ungraded portion of the project site, existing site elevations vary from approximately 80 feet AMSL to 160 feet AMSL.

Faulting and Seismicity

Review of geologic literature, previous geotechnical reports for the project site, and observations during the field investigations conducted by GEOCON (see Appendices G-1 and G-2) indicates no active faults traverse the project site. One fault was observed in Salto Intrusive rock across the "quarry" slope in the northeastern corner of the Reclamation parcel of the project site. However, GEOCON determined it was inactive.

Earthquakes that might occur on the Newport-Inglewood- Rose Canyon Fault Zone or the other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the project site. Eight known active faults are located within 50 miles of the project site. The project site is located within 6 miles of the Newport-Inglewood- Rose Canyon Fault Zone. The Newport-Inglewood-Rose Canyon Fault has the potential to produce a maximum earthquake magnitude (Mw) of 7.50 and peak ground acceleration of 0.34 g. Peak ground acceleration (PGA) is the measure of earthquake acceleration (intensity) on the ground (e.g., how hard the earth shakes in a given geographic area). Peak ground acceleration is expressed in "g" (the acceleration due to Earth's gravity, equivalent to g-force).

Additionally, the other seven known active faults located within the 50-mile radius of the project site are capable of producing a range of 6.80 to 7.85 Mw. Table 5.6-1identifies each of these faults, their distance to the project site, maximum earthquake magnitude potential, and peak ground acceleration.

Table 5.6-1. Active Faults within 50-Mile Radius of Site

Fault	Distance From Site	Maximum Magnitude Potential (Mw)	Peak Ground Acceleration (g)
Elsinore	21	7.85 Mw	0.21 g
Coronado Bank	23	7.40 Mw	0.18 g
Palos Verdes Connected	23	7.70 Mw	0.19 g
San Joaquin Hills	35	7.10 Mw	0.18 g
Earthquake Valley	42	6.80 Mw	0.13 g
San Jacinto	45	7.88 Mw	0.13 g
Chino	47	6.80 Mw	0.08 g

Source: GEOCON 2012.

The California Geologic Survey (CGS) provides a computer program that calculates the ground motion for a 10 percent of probability of exceedence in 50 years based on the average value of several attenuation relationships. Table 5.6-2 presents the calculated results for the selected faults in proximity to the project site.

Table 5.6-2. Probabilistic Site Parameters for Selected Faults

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.27	0.29	0.33

Source: GEOCON 2012.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low density, fine, clean sandy soils; and (3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. Effects of liquefaction on level ground can include sand boils, settlement, and bearing capacity failures below structural foundations. Effects of liquefaction on deep pile foundations include reduction in the resistance of piles to lateral loads and down-drag or negative friction due to settlement of liquefied strata and the strata above it.

GEOCON performed liquefaction analyses in 2009 for reclamation site grading. Results indicate that the alluvial deposition below the groundwater is not anticipated to liquefy for the design level acceleration. Therefore, the project site is not considered to contain a liquefaction hazard.

Landslides

A landslide refers to a slow to very rapid descent of rock or debris caused by natural factors such as the pull of gravity, fractured or weak bedrock, heavy rainfall, erosion and earthquakes. GEOCON reviewed 1995 published landslide maps of the CGS (formerly the Division of Mines and Geology) and the August 2003 geotechnical report by Ninyo and Moore for history of landslides and landslide deposits within the area. The data suggested the presence of suspected landslide deposits in the southwest quadrant of the project site. However, observations of intact outcrops and subsurface investigation conducted by GEOCON (see Appendices I-1 and I-2) confirmed that the landslide does not exist.

Several suspicious surficial landslides are mapped along the south bank of the Buena Vista Creek basin. These were not accessible for subsurface investigation. However, these potential landslides, if confirmed, would not be of concern as they can be removed during grading within the proposed project limits of disturbance.

Soils and Geologic Conditions

Eight surficial soil deposits and four geologic formations were encountered and/or mapped on the project site. Surficial soil deposits include compacted fill (Qcf), undocumented fill (Qudf), previously placed compacted fill (Qpcf), previously placed fill (Qpf), topsoil (unmapped), surficial landslide debris (Qlsf), alluvium (Qal), and colluvium (Qc). Formational units include Quaternary age Terrace Deposits (Qt), Tertiary-age Volcanic Rock (Tv), Santiago Formation (Ts), and Jurassic-age Salto Intrusive (Jspi) rock. The surficial soil types and geologic units are described below. Figure 5.6-1 illustrates the soil types within the project site.

Soils

Compacted Fill (Qcf). Compacted fill placed during reclamation grading exists across the northeast portion of the project site. Observation and compaction testing of the fill has been performed by GEOCON Incorporated. The fill is predominately comprised of silty to clayey sand with varying amounts of rock fragments, soil rock fills, and windrows of oversize rock and concrete.

Undocumented Fill (Qudf). Undocumented fill exists in the northeast portion of the project site and just west of the graded portions of the reclamation parcel near the central portion of the site. The majority of the undocumented fill will be removed to achieve pad grades for the project. Where it is not removed, remedial grading to remove the undocumented fill will occur. A limited amount of undocumented fill was left in-place near the central portion of the property during reclamation grading due to the presence of groundwater. These fills are the result of waste product generated from mining activities being stockpiled and/or spread out across the project site. The undocumented fill is comprised of loose, dry to wet, very porous, sandy, coarse gravel with oversize rock fragments. Undocumented fill also exists in the northeast portion of the project site beyond the reclamation grading limits. Undocumented fill is unsuitable in its present condition.

Previously Placed Compacted Fill (Qpcf). A limited area in the northeastern and southeastern portions of the project site is underlain by previously placed compacted fill. According to an August 2003 report by Ninyo and Moore, most of the approximately 10 feet of documented fill in the bottom of the northern "pit area" had been placed between approximately 1988 and 2000 (GEOCON 2012). The report describes the fill as "interlayered, medium dense to dense, clayey and silty sand, clayey gravel and stiff sandy clay." Portions of the compacted fill were buried beneath stockpiles of oversize shot-rock that was removed during recent reclamation grading. The upper approximately three to five feet of previously placed compacted fill was removed during reclamation grading and recompacted. Previously placed compacted fill associated with the development of the Wal-Mart shopping center encroaches into the southeastern portion of the project site. These materials were partially removed and recompacted during recent grading operations, as part of the reclamation project. Based on observations during reclamation grading, the fill appears to be relatively dense with adequate moisture content (GEOCON 2012).

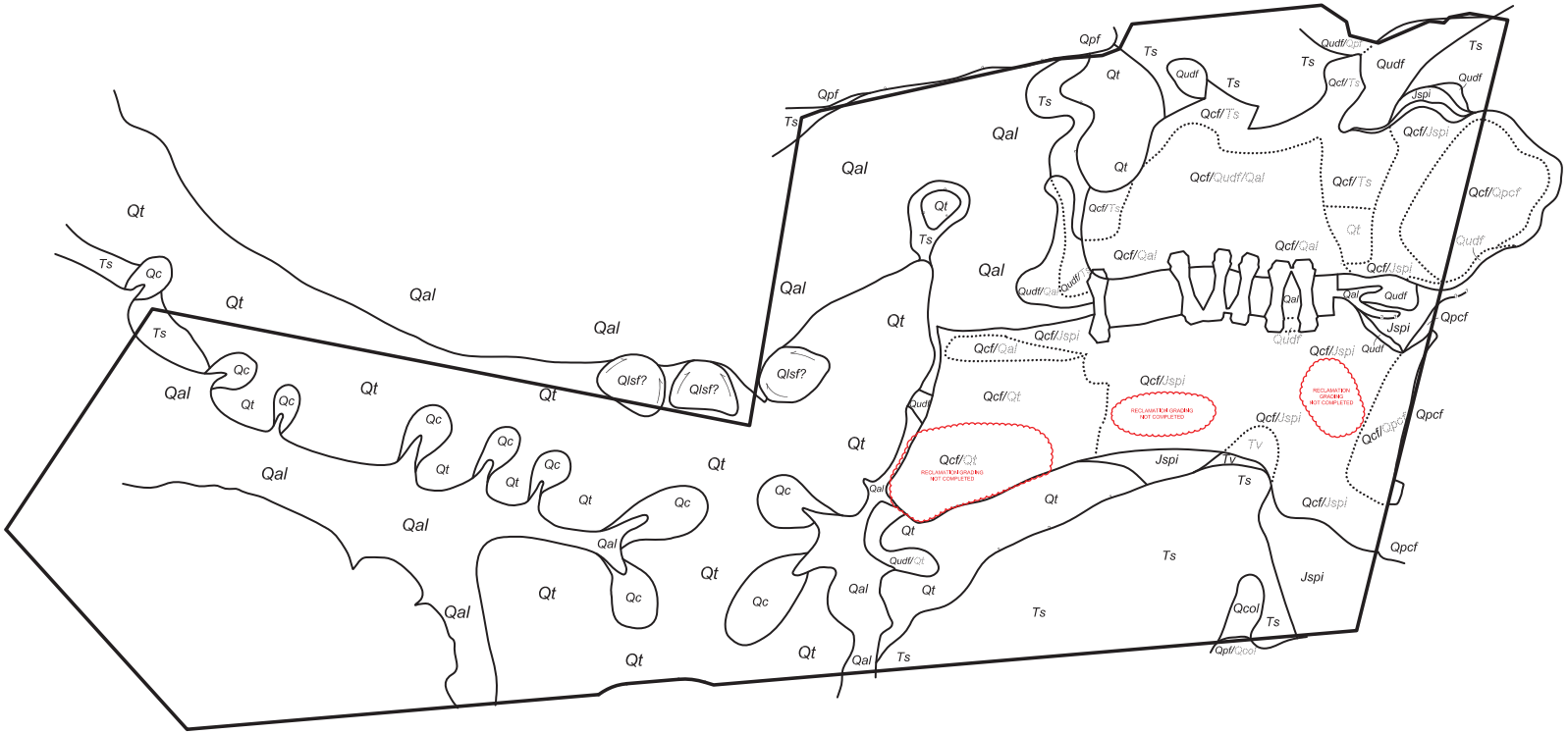
Previously Placed Fill (Qpf). The project site contains an area of previously placed fill near Haymar Road and State Route 78 (SR-78) along the northern project site boundary.

Topsoil (Unmapped). Portions of the western side of the project site are irregularly blanketed by one to three feet of topsoil consisting of loose, porous, dark brown, silty to clayey, fine sand. Topsoil is compressible and expansive.

Surficial Landslide Debris (Qlsf). Several suspicious surficial landslides are mapped within the western portion of the project site, along the south banks of the Buena Vista Creek basin. Due to the limited access to these areas, subsurface investigation was not performed. GEOCON excavated soil at one of these areas and showed approximately five feet of sandy clay material overlying bedrock formation.

Alluvium (Qal). Alluvial deposits are present within the major east-west drainage of Buena Vista Creek, as well as in the northeastern and southwestern tributary canyons that converge with Buena Vista Creek in the central portion of the project site. The alluvial soils generally consist of loose, porous dark gray to dark brown, very clayey, fine to medium sand, and clayey sand and silt with occasional layers of slightly silty sand. Areas of deepest alluvium are located in the central portion of the project site adjacent to the original channel of Buena Vista Creek and its tributaries. The majority of remedial grading of the alluvium along the north and south sides of the main Buena Vista Creek drainage has occurred as a result of the reclamation grading. Alluvium is expected to be encountered along the toe of the south facing fill slope at the west end of the property.

G:\GIS_Production\Projects\CityofCarlsbad_8419\QuarryCreek_EIR_177772\Graphics\docs



GEOCON LEGEND

- Qudf ..... UNDOCUMENTED FILL (Dotted Where Buried)
- Qcf ..... COMPACTED FILL (Dotted Where Buried)
- Qpcf ..... PREVIOUSLY COMPACTED FILL (Dotted Where Buried)
- Qpf ..... PREVIOUSLY PLACED FILL (Dotted Where Buried)
- Qal ..... ALLUVIUM (Dotted Where Buried)
- Qcol ..... COLLUVIUM
- Qlsf ..... SURFICIAL LANDSLIDE
- Qt ..... TERRACE DEPOSIT (Dotted Where Buried)
- Tv ..... VOLCANIC ROCK (Dotted Where Buried)
- Ts ..... SANTIAGO FORMATION (Dotted Where Buried)
- Jspi ..... SALTO INTRUSIVE (Dotted Where Buried)

Soils

FIGURE 5.6-1

Colluvium (Qc). Colluvial deposits were encountered in the southwest portion of the project site mostly along the sides of the draining tributary canyons. Colluvium is comprised of approximately four to six feet of loose dark brown, very clayey to silty, fine sand.

Geologic Units

Terrace Deposits (Qt). Extensive and thick river terrace deposits consisting of medium-dense to dense, light reddish-brown to olive-brown, gravelly, silty to clayey, medium to coarse sand to cohesionless sand with occasional layers of silty clay are present in the western and southwest portions of the project site. Except near depositional contacts (or unconformities) with older formations, this unit is typically massive to horizontally bedded, relatively dense and exhibits low compressibility characteristics. Terrace Deposits are most prevalent in the southwestern portions of the project site.

Tertiary Volcanics (Tv). Tertiary-age volcanic rocks are present in a limited lens-shape area exposed in the southeast portion of the site in the existing 2:1 cut slope between approximate elevations 120 to 140 feet AMSL. It consists of deeply weathered, massive light reddish-brown, moderately strong, volcanic tuff. This unit exhibits medium-dense to dense characteristics with little indication of slope erosion.

Santiago Formation (Ts). The Eocene-aged Santiago Formation, consisting of dense, massive bedded light brown to greenish-gray sandstones and thin interbedded siltstones, is present in the north-central and south-central portions of the project site. The Santiago Formation is generally granular and possesses suitable geotechnical characteristics in either an undisturbed and/or properly compacted condition. However, the occurrence of clayey siltstones and claystone layers in this unit may generate moderate to highly expansive materials, or localized expansive zones at grade.

Salto Intrusive (Jspi). The Jurassic-aged Salto Intrusive consists of a steeply jointed, dark gray, very strong tonalite to gabbro rock considered to be older than the Peninsular Range Batholith and more closely related to the formation of the Santiago Peak Volcanics (Larsen 1948, as cited by GEOCON). This granitoid bedrock unit is present in the northeast and southeast corners of the project site and is the predominant geologic unit that has been mined for aggregate on the project site. Typically, this bedrock unit outcrops along the eastern or southeastern boundary of the project site, or is covered by fill in the central portions of the project site.

Soil-Related Hazards

The physical properties of the soil base can greatly influence improvements constructed upon them. As an example, expansive soils are largely comprised of clays, which greatly increase in volume when water is absorbed and shrink when dried. This movement may result in the cracking of foundations for aboveground, paved roads, and concrete slabs. Clayey and silty clay soils occur throughout the project site and have a high expansion potential. Grading will occur to reduce the potential impact of expansive soil movement. Expansive soils will be mixed with sandy soils and/or buried at a depth of at least three feet below pad grade such that soils in the upper three feet of pad grade consists of very low to medium expansion potential.

Groundwater

Groundwater was encountered in the major lower elevation drainage areas of Buena Vista Creek and its tributaries at elevations between 70 to 80 feet AMSL. Depth of groundwater is subject to fluctuation from natural seasonal variations.

5.6.2 Regulatory Setting

State

Alquist-Priolo Special Studies Zone Act (1972)

The Alquist-Priolo Special Studies Zone Act (AP Act) was passed into law following the destructive February 9, 1971 San Fernando earthquake. The AP Act provides a mechanism for reducing losses from surface fault rupture on a statewide basis. The intent of the AP Act is to ensure public safety by prohibiting the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. The State Geologist (Chief of the California Division of Mines and Geology) is required to identify "earthquake fault zones" along known active faults in California. Counties and cities must withhold development permits for human occupancy projects within these zones unless geologic studies demonstrate that there would be no issues associated with the development of a project. Based on a review of maps produced by the CGS, no faults are mapped under the AP Act within the area of the Master Plan.

California Building Code

The California Building Standards Commission is responsible for coordinating, managing, adopting, and approving building codes in California. On January 1, 2010, the Commission adopted and published the 2009 International Building Code as the 2010 California Building Code (CBC). This code became effective in June 2010 and replaces the 2007 CBC. The State of California provides minimum standards for building design through the 2010 CBC (CCR, Title 24). Where no other building codes apply, Chapter 18 of the 2010 CBC regulates excavation, foundations, and retaining walls. The CBC applies to building design and construction in the state and is based on the federal Uniform Building Code (UBC) used widely throughout the country (generally adopted on a state-by-state or district-by-district basis).

The 2007 CBC replaces the previous "seismic zones", which assigned a number from 1 to 4, where 4 required the most earthquake-resistant design, with new Seismic Design Categories (SDC) A through F. With the new Seismic Design Categories, F requires the most earthquake-resistant design. With the shift from seismic zones to seismic design, the CBC philosophy has shifted from "life safety design" to "collapse prevention," meaning that structures are designed for prevention of collapse for the maximum level of ground shaking that could reasonably be expected to occur at a site. The 2010 CBC includes additional changes in the SDC for residential buildings in California, as well as other seismic requirements. Chapter 16 of the CBC specifies exactly how each seismic design category is to be determined on a site-specific basis through the site-specific soil characteristics and proximity to potential seismic hazards.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act aims to reduce the threat of seismic hazard to public health and safety by identifying and mitigating seismic hazards. Through the act, the California Department of Conservation, Division of Mines and Geology, is directed to delineate seismic hazard zones. State, County, and City agencies are directed to utilize such maps in land use and permitting processes. The act also requires geotechnical investigations particular to the site be conducted before permitting occurs on sites within seismic hazard zones. To date, a Seismic Hazards Map has not been prepared for the City of Carlsbad (CGS Seismic Hazard Zonation Program 2012).

Local

City of Carlsbad General Plan – Public Safety Element

The Public Safety Element introduces safety considerations into the planning and decision-making processes of the City to reduce the risk of injury, loss of life, property damage and economic and social dislocation resulting from natural and manmade hazards. Within the Public Safety Element, specific goals, objectives and implementing policies and action programs address geology and seismic safety. Section 5.10 Land Use and Planning of this EIR identifies these policies.

5.6.3 Project Impacts

5.6.3.1 Thresholds of Significance

As defined in Appendix G of the *CEQA Guidelines*, project impacts with regards to soils and geologic hazards would be considered significant if the project was determined to:

- Expose people or structures to potential substantive adverse effects, including the risk of loss, injury, or death involving:
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (Refer to Division of Mines and Geology Special Publication 42);
    - Strong seismic ground shaking;
    - Seismic related ground failure, including liquefaction;
    - Landslides;
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- Be located on expansive soil, as defined in the latest UBC, creating substantial risks to life or property; or
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

5.6.3.2 Environmental Impacts

Fault Rupture and Ground Shaking

Although the project site is located in a seismically-active area, there are no known active faults that extend across or trend toward the project site. Additionally, the project site is not located within a mapped Alquist-Priolo Earthquake Fault Zone as delineated by the CGS. Therefore, there is no risk of fault rupture or ground fracturing at the project site.

As previously discussed, the project site is located within six miles of the Newport-Inglewood- Rose Canyon Fault Zone and is within 50 miles of seven other known active faults capable of producing a range of 6.80 to 7.85 Mw. In the event of an earthquake along one of these faults, seismic hazards related to ground motion could occur in susceptible areas within the project site. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the moment magnitude, and the duration of shaking. Given the proximity of the project site to the Newport-Inglewood-Rose Canyon fault and the calculated peak ground acceleration for the area (Tables 5.6-1 and 5.6-2), ground motions within the project site could result in damage to structures. This is considered a significant impact. However, the project would be subject to the recommendations within the site-specific geotechnical investigations. Implementation Mitigation Measure GS-1 would ensure compliance with the design recommendations provided in site-specific geotechnical investigations. The proposed project would also be required to comply with the City's standard conditions of approval as outlined in Section 5.6.5.

The proposed and future project structures would be subject to the requirements of the CBC for resistance to seismic shaking. In addition, the proposed project would be constructed in accordance with other CBC criteria, current seismic design specifications of the Structural Engineers Association of California, other applicable regulations, ongoing site-specific geotechnical investigations, and all applicable requirements of the State of California Occupational Safety and Health Administration (Cal-OSHA).

Liquefaction

Based on underlying geology, generally consisting of cohesive soil materials (e.g., silts and clays which bond together), the potential for liquefaction to occur within the project site is considered low. GEOCON conducted liquefaction analyses in 2009 for the Reclamation parcel within the project site for reclamation plan grading. GEOCON determined that the alluvial deposits below the groundwater do not possess liquefaction tendencies. Therefore, the impact associated with liquefaction potential is considered less than significant. Additionally, the site-specific geotechnical investigations provide design recommendations and standards for development within the Reclamation parcel. Implementation Mitigation Measure GS-1 would ensure compliance with the design recommendations provided in site-specific geotechnical investigations, ensuring a less than significant impact. In addition, the proposed project would be required to comply with the City's standard conditions of approval as outlined in Section 5.6.5.

Landslides

The project site ranges in elevation from approximately 80 feet to 300 feet AMSL in open space areas and 80 feet AMSL to 160 feet AMSL at the western, ungraded portion of the project site. Topography throughout the site is generally hilly with flatter areas. Based on the preliminary geotechnical investigation conducted by GEOCON, which includes observations of intact outcrops and confirmation of undisturbed slope conditions during previous field studies by geologic mapping and excavation of exploratory trenches within the mapped slide area, the potential for on-site landslides does not exist. Several suspicious surficial landslides are mapped along the south bank of the Buena Vista Creek. These areas were not accessible to subsurface investigation. However, the potential landslides, even if confirmed, do not represent a significant geotechnical hazard to the proposed project. It is expected that removal and recompaction of the surficial landslides will be possible within the limits of project grading. Implementation Mitigation Measure GS-1 would ensure compliance with the design recommendations provided site-specific geotechnical investigations. In addition, the proposed project would be required to comply with the City's standard conditions of approval as outlined in Section 5.6.5.

Soil Erosion Potential

Implementation of the project will involve mass grading activities, including the removal of compressible surficial soils (undocumented fill, alluvium, colluviums, and topsoil). Construction activities would expose soils within the project site to wind and water erosion. The City's standard conditions of approval as outlined in Section 5.6.5 below would require preparation of an erosion control plan and implementation of erosion control measures. Therefore, the impact associated with soil erosion is considered less than significant.

Expansive Soils and Unstable Soils

As previously described, soil materials within the project site are expected to have very low to medium expansion potential. Some of the surficial soils and portions of the Santiago Formation could have high expansive soil conditions due to the high proportion of clay, which may exhibit a moderate to high potential for shrink-swell. Shrink-swell soils could exert additional pressure on buried structures and electrical connections producing shrinkage cracks that could allow water infiltration and compromise the integrity of backfill material. These conditions could be worsened if structural facilities are constructed directly on expansive soil materials. As such, the potential for expansive soils to affect the proposed project is considered a significant impact. Site-specific geotechnical investigations will provide design recommendations and standards for development within the Reclamation parcel.

The proposed project will not construct terrace drains on proposed cut or fill slopes exceeding 30 feet in height, as the use of terrace drains has been determined to not be necessary to maintain gross stability of the slopes (GEOCON 2011). This recommendation is based on the fact that improperly-maintained terrace drains can result in significant slope erosion and possible slope distress. Terrace drains that fill will debris have the potential to concentrate surface runoff down the slope face, resulting in deep, extensive erosion gullies. Because project slopes will be less than 40 feet in height, terrace drains are not recommended (GEOCON 2011). Additionally, at Lot 12, the silt fence/limits of grading will be constructed with a 2-foot wide bench, which would deviate from City standards. However, this condition has been evaluated by GEOCON and is considered feasible (without jeopardizing erosion or slope stability).

Implementation Mitigation Measure GS-1 would ensure compliance with these recommendations. In addition, the proposed project would be required to comply with the City's standard conditions of approval as outlined in Section 5.6.5.

Septic

The proposed project would not be serviced by septic tanks or other alternative wastewater disposal systems. The project would be served by municipal sewer/wastewater service, which would be provided by the City of Carlsbad and the Encina Wastewater Authority (EWA) as identified in Section 5.15, Utilities and Service Systems. Therefore, no impacts would occur.

Off-site Improvements

Implementation of the proposed project will require construction of off-site improvements as described in EIR Section 3.0. Only minor grading would be associated with the utility and trailhead improvements and connections. Grading would occur to the east of the project site in the adjacent City of Oceanside parcel immediately east of PA R-1 and at the existing retaining wall on the western boundary of the

Quarry Creek Plaza shopping center. Any grading and earthwork associated with these improvements would be required to be conducted in accordance with City standards and geotechnical recommendations as required by Mitigation Measure GS-1 and the impact would be less than significant.

5.6.4 Level of Significance Before Mitigation

The project site is located within a seismically active region and is susceptible to ground shaking and potential damage due to geologic hazards associated with earthquake activity as discussed above. Impacts are considered potentially significant before mitigation.

5.6.5 Environmental Mitigation Measures

The following mitigation measure shall be implemented in order to minimize impacts to potential geological and soils resources:

GS-1 Prior to approval of final engineering and grading plans for each phase of development within the project site, the City shall verify that all recommendations contained in the *EIR-Level Soil and Geologic Reconnaissance* (October 20, 2011) and the *Preliminary Geotechnical Investigation* (May 11, 2012) prepared by GEOCON have been incorporated into all final engineering and grading plans. The City's soil engineer and engineering geologist shall review grading plans prior to finalization, to verify plan compliance with the recommendations of the report. All future grading and construction of the project site shall comply with the geotechnical recommendations contained in the geotechnical reports. These reports identify specific measures for mitigating geotechnical conditions on the project site, and addresses grading, foundations, and proper on site drainage.

City Standard Conditions of Approval

In addition to the Mitigation Measure identified above, the project will be required to comply with the following city standard Conditions of Approval:

- The proposed project shall comply with the City's Excavation and Grading Ordinance (§15.16, Carlsbad Municipal Code).
- Grading information shall be submitted for review by the City with each subdivision map. Grading shall comply with grading standards and manufactured slope revegetation requirements of the City.
- All applicable federal, state, and local permits regarding drainage shall be obtained. Such permits include the National Pollution Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board.
- Erosion control measures shall be provided to the satisfaction of the City Engineer in accordance with the City's grading and erosion control requirements (Municipal Code §15.16. et seq.). The locations of all erosion control devices shall be noted on the grading plans.
- All grading permits issued authorizing grading during the rainy season (November 16 of any year to April 14 of the following year), shall require the installation of all erosion and sedimentation control protective measures in accordance with city standards. Erosion and runoff control measures shall be designed and bonded prior to approval of grading permits by the City.

- All permanent slopes shall be planted with erosion control vegetation, drained and properly maintained to reduce erosion within 30 days of completion of grading. Erosion control and drainage devices shall be installed in compliance with the requirements of the City.
- All erosion and sedimentation control protective measures shall be maintained in good working order throughout the duration of the rainy season unless it can be demonstrated to the City Engineer that their removal at an earlier date will not result in any unnecessary erosion of or sedimentation on public or private properties.

5.6.6 Level of Significance After Mitigation

Implementation of Mitigation Measure GS-1 will reduce the impact to geology/soils to a level of less than significant. Additionally, the proposed project will be required to comply with the City's standard Conditions of Approval.

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